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Technical Specification Sheet
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Power Modular Equipment Controller for BACnet Networks

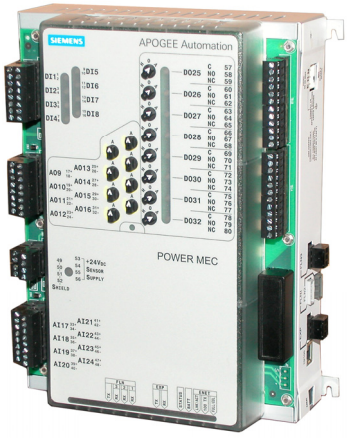

Figure 1. Power Modular Equipment Controller.

Description

The Power Modular Equipment Controller for BACnet® Networks is an integral part of the APOGEE® Automation System. The controller is a part of a family of high performance, modular Direct Digital Control (DDC) supervisory equipment controllers. The controller is classified as a BACnet Building Controller (B-BC) and utilizes the BACnet/IP protocol. The controller operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor.

The Power MEC communicates with other field panels or workstations on a peer-to-peer Automation Level Network (ALN). The ALN supports the BACnet/IP protocol over 10/100 MB Ethernet networks.

The Power MEC can optionally provide central monitoring and control for distributed Field Level Network (FLN) devices (wired or wireless). Via Power MEC part number selection, the FLN may support RS-485 for configurable BACnet MS/TP or P1 support, or, LonTalk® protocol support.

Features

- BACnet Building Controller (B-BC) using BACnet/IP protocol
- Several versions of controllers to match application requirements
- Remote mounted external analog and digital point expansion modules for added point expansion which may be independently operated as FLN devices or directly controlled on an optional point expansion bus
- Proven program sequences to match equipment control applications
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes
- Built-in energy management applications and DDC programs for complete facility management
- Comprehensive alarm management, historical data trend collection, operator control and monitoring functions
- Message control for terminals, printers, pagers and workstations
- Option with Hand Off Auto (HOA) switches
- Option for compatibility with LonWorks® networks
- Wireless FLN support

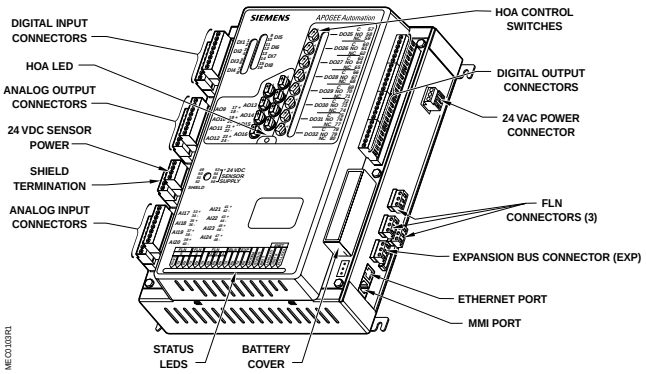

Figure 2. Power Modular Equipment Controller components and key features.

Hardware

Controllers

Several styles of controllers provide flexibility and expansion to meet application needs. All the Power MEC "EB" and 'EBx" versions support industry standard BACnet/IP networks through a direct connection to 10/100 Base-T for ALN communications.

Power MEC Controller – 11xxEB

In addition to building and system management functions, this controller provides control of the 32 points contained on the input/output point board.

Power MEC Controller– 12xxEB

In addition to control of the 32 points on the input/output point board, this controller supports analog and digital point expansion modules, which can be mounted remote from the controller. This capability expands the point capacity of the Power MEC and provides for cost-effective placement of the point terminations close to the load.

Power MEC Controller – 12xxEFB

The Power MEC "EFB" version adds three connections to the APOGEE FLN, for a total of 96 devices supervised by the Power MEC, or it may be configured for a single BACnet MS/TP connection supporting up to 96 devices.

Power MEC Controller – 12xxELB

The Power MEC "ELB" version adds LonWorks compatibility at the FLN. It is equipped with a Neuron Microprocessor and FTT-10A Transceiver. Instead of three connections to the APOGEE FLN, it has a single connection for a LonWorks network.

The "ELB" versions have a LonWorks network database server embedded. This database maintains a dynamic, real-time representation of the LonWorks network including connections/bindings, node status, and configuration parameters values.

The Power MEC consists of the following three major components: the Input/Output Point Board, the Power Supply, and the Controller Board.

- **Input/Output Point Board**

The input/output point board contains 32 points that perform A/D or D/A conversion, signal processing, point command output and communication with the controller board. The terminal blocks are removable for easy termination of field wiring. The analog input points are selectable to be 0-10V, 4-20 mA, 1K RTD or optional 100K Thermistor. The analog output points are also selectable to be either 0-10V or 4-20 mA. The digital inputs are dry contact, with four being pulse accumulator inputs. The digital outputs support 110/220V Form C rated relays.

- **Power Supply**

The power supply provides regulated power to the input/output point board and active sensors. The power supply is internal to the Power MEC housing, simplifying installation and troubleshooting.

The power supply works with the controller board to ensure smooth power up and down sequences for the equipment controlled by the I/O point board and analog and digital point blocks, even through brown-out conditions.

Status LEDs indicate 24 Vac supplied from the power supply and 24 Vdc supplied to the input/output point board.

- **Controller Board**

The controller board is a microprocessor-based multi-tasking platform for program execution and communications with the I/O point board and with other Power MECs and field panels over the ALN.

The 12xx controllers can also support analog or digital point expansion modules, which provide for point expansion capability to match the application requirements. The controller board scans field data, optimizes control parameters and manages operator requests for data.

An RS-232 operator terminal port with a quick connect phone jack (RJ-11) is included with each controller board for operator devices such as a Local User Interface (LUI), simple CRT terminal, laptop PC, or printer. In addition, the MEC 13xx controller supports an RS-232 quick connect phone jack (RJ-45) for use with a phone modem for APOGEE autodial stand-alone network capability.

The 12xxEFB controllers support 3 FLN trunks for communications with a total of 96 FLN devices, or one BACnet MS/TP trunk supporting up to 96 devices. The 12xxELB controllers support 1 FLN trunk for communications with a maximum of 126 LonWorks devices.

The program and database information stored in the Power MEC RAM memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the controller board illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.

The firmware, including the operating system, is stored in non-volatile flash ROM memory, allowing for ease of upgrade at the job site if a new firmware update is made available by simply flashing the ROM.

Brownout protection and power recovery circuitry protect the controller board from power fluctuations.

PX Series Enclosure Assemblies

PX series enclosures house both electronic and pneumatic components. The enclosures include a perforated backplane for mounting of the PXC series controllers, Power Modular Equipment Controllers, Point Expansion Modules or other electronic or pneumatic components. Two sizes are available (19” and 34”) that can house the Power MEC:

- 19” enclosure, hinged door and key lock
- 34” enclosure, hinged door and key lock
- 18" enclosure, pull-box type utility cabinet (for accessories, not for MEC)

The enclosures are constructed of metal to accommodate secure conduit fittings and protect components against electrical transients. The enclosure allows space for easy wire routing and terminations.

Service Box

Service boxes are available for mounting in the 19” or 34” enclosures. Models provide step down power from either 115 Vac or 230 Vac to 24 Vac and offer protection against electrical transients. The service boxes are sized in various power ratings to provide one or two Class 1 Power Limited terminations for use inside the enclosure to power controllers and I/O modules, and one Class 2 termination for use outside the enclosure to power remote devices. The 115 Vac versions provide two 115 Vac outlets for accessory devices such as modems and laptops. Optional sidewall kits are available for service box installation in other NEMA Type 1 or better enclosures such as motor control cabinets.

Figure 3. PX Series Enclosure Assemblies.

Analog and Digital Point Expansion Modules

In addition to the points on the input/output board, the 12xx Power MECs support analog and digital Point Expansion Modules. The controller can support a maximum of any combination of eight modules. They can be mounted next to or remote from the controller depending upon the job requirements. The total length of the wiring run for Point Expansion Modules is a maximum of 200 feet (61 meters) on the MEC expansion bus. Point Expansion Modules are also compatible with the APOGEE P1 FLN.

Point Expansion Module details are:

- Analog Point Expansion Module – 4AI, 4AO
- Analog Point Expansion Module – 8AI
- Digital Point Expansion Module – 4DI, 4DO
- Digital Point Expansion Module – 8DI, 4DO

The analog input points are user selectable to be 0-10V, 4-20 mA, 1K RTD or optional 100K Thermistor input. The analog output points are also user configurable to be 0-10V or 0-20 mA.

The digital inputs are dry contact with four of the inputs being pulse accumulator points. The relayed digital output points support 110/220V Form C relays.

Figure 4. Analog and Digital Point Expansion Modules.

Modular Equipment Control with Application Flexibility

The Power MECs are high performance controllers with complete flexibility to allow the owner to customize each controller with the exact program for the application. In addition, each controller can be sized to meet the hardware requirements for the application.

The control program for each panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a BASIC type programming language provides direct digital control and energy management sequences to control equipment precisely and optimize energy usage.

Menu Prompted, English Language Operator Interface

The Power MEC has a simple, yet powerful menu driven English Language Operator Interface that provides, among other things:

- Point monitoring and display,
- Point commanding,
- Historical trend collection and display for multiple points,
- Event scheduling,
- Program editing and modification via Powers Process Control Language (PPCL),
- Alarm reporting and acknowledgment, and
- Continual display of dynamic information.

Global Information Access

Each Power MEC is equipped with one RS-232 operator terminal port. This port supports the connection of a Local User Interface (LUI), simple CRT terminal, laptop PC, or printer. Devices connected to the terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. When using the Ethernet ALN option, multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Built-in Direct Digital Control Routines

The Power MEC provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. The controller receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available:

- Adaptive control, auto adjusting closed loop control, provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. Superior in terms of response time, holding steady state, and minimizing error, oscillations and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control
- Logical sequencing,
- Alarm detection and reporting, and
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the Power MEC and require simple parameter input for implementation:

- Peak demand limiting
- Start-Stop time optimization
- Equipment scheduling, optimization and sequencing
- Temperature compensated duty cycling
- Economizer control
- Night setback control
- Automatic Daylight Savings Time switchover
- Temporary schedule override
- Holiday scheduling, Calendar-based scheduling, and Event scheduling

Specifications

Processor Motorola MPC - 1xxxEB, 1xxxEFB, 1xxxELB	860T
Processor Clock Speed	48 MHz
Memory	64 MB RAM/8mb FLASH (72 MB Total)
Battery Backup of RAM (field Replaceable) AA Alkaline	14 days typical
Network Communication:	
Automation Level Network	10/100 Base-T for BACnet/IP ALN
Field Level Network	38.4 Kbps for LonWorks FLN P1 FLN or BACnet MS/TP FLN: 9600, 19200, 38400
Point Expansion Bus	38.4 Kbps
A/D Resolution (analog in)	12 bits
D/A Resolution (analog out)	8 bits
Local Communication Interface	RS-232 port
Voltage Requirements	
Service Box, 115V	115 Vac +/- 15% @ 60 Hz +/- 5%
Service Box, 230V	230 Vac +/- 15% @ 50/60 Hz +/- 5%
Controller or Expansion Module	20 Vac to 30 Vac @ 47 Hz to 63 Hz
Power Consumption	
Power Modular Equipment Controllers	50 VA
Analog Point Expansion module 8AI	17 VA @ 24 Vac
Analog Point Expansion module 4AI/4AO	14 VA @ 24 Vac
Digital Point Expansion module 8DI/4DO	20 VA @ 24 Vac
Digital Point Expansion module 4DI/4DO	17 VA @ 24 Vac
Enclosure Type	NEMA 1
Ambient Operating Environment	+32°F to +120°F (0°C to +49°C) 93% RH (Non-condensing)
Agency Listings	UL 864 UUKL ULC-C100 UUKL7 UL 916 PAZX
Agency Compliance	FCC Compliance Australian EMC Framework European EMC Directive (CE) European Low Voltage Directive (LVD)
Dimensions:	
Modular Equipment Controller	11.4" H × 9.5" W × 3.75" D (289 mm × 241 mm × 95 mm)
Analog Point Expansion Module	6" H × 9.5" W × 3.75" D (152 mm × 241 mm × 95mm)
Digital Point Expansion Module	6" H × 9.5" W × 3.75" D (152 mm × 241mm × 95mm)
NEMA Type 1 Enclosures:	
18” Utility Cabinet Enclosure	18" H × 14" W × 6" D (457.2 mm × 356.6 mm × 152.4 mm)
19” Enclosure	19" H × 22" W × 5.75" D (482.6 mm × 558.8 mm × 146.1 mm)
34” Enclosure	34" H × 22" W × 5.75" D (863.6 mm × 558.8 mm × 146.1 mm)
Mounting Surface	Building Wall or Structural Member

Ordering Information

Controller Range

Description	Product Number
Power BACnet MEC 1100 EB, 8DI, 8DO, 8AI, 8AO, HOA-ready, BACnet/IP Ethernet ALN	549-630
Power BACnet MEC 1110 EB, 8DI, 8DO, 8AI, 8AO, with HOA, BACnet/IP Ethernet ALN	549-631
Power BACnet MEC 1200 EB, 8DI, 8DO, 8AI, 8AO, point expansion support, HOA-ready, BACnet/IP Ethernet ALN	549-632
Power BACnet MEC 1210 EB, 8DI, 8DO, 8AI, 8AO, point expansion support, with HOA, BACnet/IP Ethernet ALN	549-633
Power BACnet MEC 1200 EFB, 8DI, 8DO, 8AI, 8AO, point expansion support, RS-485 FLN support, HOA-ready, BACnet/IP Ethernet ALN	549-634
Power BACnet MEC 1210 EFB, 8DI, 8DO, 8AI, 8AO, point expansion support, RS-485 FLN support, with HOA, BACnet/IP Ethernet ALN	549-635
Power BACnet MEC 1200 ELB, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, HOA-ready, BACnet/IP Ethernet ALN	549-636
Power BACnet MEC 1210 ELB, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, with HOA, BACnet/IP Ethernet ALN	549-637
Point Expansion Modules	
Analog Point Expansion Module, 4AI/4AO 24V HOA-ready - for MEC Expansion or FLN	549-214
Analog Point Expansion Module, 4AI/4AO 24V with HOA - for MEC Expansion or FLN	549-215
Digital Point Expansion Module, 4DI/4DO 24V HOA-ready - for MEC Expansion or FLN	549-212
Digital Point Expansion Module, 4DI/4DO 24V with HOA - for MEC Expansion or FLN	549-213
Analog Point Expansion Module, 8AI 24V – for MEC Expansion or FLN	549-209
Digital Point Expansion Module, 8DI/4DO 24V HOA-ready – for MEC Expansion or FLN	549-210
Digital Point Expansion Module, 8DI/4DO 24V with HOA – for MEC Expansion or FLN	549-211
Service Boxes and Enclosures	
Service Box, 115V to 24 Vac – *until existing stock is depleted*	549-506
Service Box, 230V to 24 Vac – *until existing stock is depleted*	549-507
PX Series Service Box — *available by 2009* — 115V, 24 Vac, 50/60 Hz, 192 VA	PXA-SB115V192VA
PX Series Service Box — *available by 2009* — 115V, 24 Vac, 50/60 Hz, 384 VA	PXA-SB115V384VA
PX Series Service Box — *available by 2009* — 230V, 24 Vac, 50/60 Hz, 192 VA	PXA-SB230V192VA
PX Series Service Box — *available by 2009* — 230V, 24 Vac, 50/60 Hz, 384 VA	PXA-SB230V384VA
18" Enclosure (Utility Cabinet) (UL Listed NEMA Type 1 Enclosure)	PXA-ENC18
19” Enclosure (UL Listed NEMA Type 1 Enclosure)	PXA-ENC19
34” Enclosure (UL Listed NEMA Type 1 Enclosure)	PXA-ENC34

HOA Upgrade-Kits

Description	Product Number
HOA Upgrade Kit Analog Point Block 4AI/4AO	549-520
HOA Upgrade Kit Digital Point Block 4DI/4DO	549-518
HOA Upgrade Kit Digital Point Block 8DI/4DO	549-519

Accessories	
Description	**Product Number**
Modem Cable (DB25 male to RJ-45 8-pin) for hardware flow control of autodial (Dial-up) modem	549-510
MMI Extension Cable, (RJ-11 male to female) for printers or terminals outside of enclosure	545-712
MMI Cable (DB9 female to RJ-11 6-pin) for no flow control operator interface connections	540-143

Documentation	
Description	**Document Number**
Power Modular Equipment Controller Owner's Manual	125-2183
Powers Process Control Language (PPCL) User's Manual	125-1896

BACnet Protocol
Implementation Conformance Statement

Products

Product	Model Number	Protocol Revision	Software Version	Firmware Version
Power BACnet Modular Equipment Controller	1200-EFB 1210-EFB 1200-ELB 1210-ELB 1100-EB 1110-EB 1200-EB 1210-EB	135-2004	N/A	3.1

Vendor Information

Siemens Building Technologies
1000 Deerfield Parkway
Buffalo Grove, IL 60089
www.sbt.siemens.com

Product Description

An integral member of the APOGEE product family, the Power MEC for BACnet Networks is a high performance, modular Direct Digital Control (DDC) supervisory equipment and primary building controller. The Power MEC operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. The Power MEC communicates on a 10/100 MB Ethernet BACnet/IP network. It can optionally provide central monitoring and control for distributed Field Level Network (FLN) devices.

BACnet Standardized Device Profile (Annex L)

Supported	Device Profile
	BACnet Operator Workstation (B-OWS)
•	BACnet Building Controller (B-BC)
	BACnet Advanced Application Controller (B-AAC)
	BACnet Application Specific Controller (B-ASC)
	BACnet Smart Actuator (B-SA)
	BACnet Smart Sensor (B-SS)

Supported BACnet Interoperability Building Blocks (BIBBs)

BIBB	Name	Initiate	Execute
Data Sharing			
DS-RP-A	Data Sharing-ReadProperty-A	•	
DS-RP-B	Data Sharing-ReadProperty-B		•
DS-RPM-A	Data Sharing-ReadPropertyMultiple-A	•	
DS-RPM-B	Data Sharing-ReadPropertyMultiple-B		•
DS-WP-A	Data Sharing-WriteProperty-A	•	
DS-WP-B	Data Sharing-WriteProperty-B		•
DS-WPM-B	Data Sharing-WritePropertyMultiple-B		•
DS-COV-A	Data Sharing-COV-A	•	
DS-COV-B	Data Sharing-COV-B		•
DS-COVU-A	Data Sharing-COV-Unsolicited-A	•	
DS-COVU-B	Data Sharing-COV-Unsolicited-B		•
Scheduling			
SCHED-I-B	Scheduling-Internal-B		•
SCHED-E-B	Scheduling-External-B		•
Alarm and Event Management			
AE-N-A	Alarm and Event-Notification-A	•	
AE-N-I-B	Alarm and Event-Notification Internal-B		•
AE-ACK-A	Alarm and Event-ACK-A	•	
AE-ACK-B	Alarm and Event-ACK-B		•
AE-ASUM-B	Alarm and Event-Alarm Summary-B		•
AE-ESUM-A	Alarm and Event-Enrollment Summary-A	•	
AE-ESUM-B	Alarm and Event-Enrollment Summary-B		•
AE-INFO-A	Alarm and Event-Information-A	•	
AE-INFO-B	Alarm and Event-Information-B		•
Trending			
T-VMT-A	Trending-Viewing and Modifying Trends-A	•	
T-VMT-I-B	Trending-Viewing and Modifying Trends-Internal-B		•
T-VMT-E-B	Trending-Viewing and Modifying Trends-External-B		•
T-ATR-B	Trending-Automated Trend Retrieval-B		•
Network Management			
NM-CE-A	Network Management-Connection Establishment-A	•	

Device Management			
DM-DDB-A	Device Management-Dynamic Device Binding-A	•	
DM-DDB-B	Device Management-Dynamic Device Binding-B		•
DM-DOB-A	Device Management-Dynamic Object Binding-A	•	
DM-DOB-B	Device Management-Dynamic Object Binding-B		•
DM-DCC-B	Device Management-DeviceCommunicationControl-B		•
DM-PT-A	Device Management-Private Transfer-A	•	
DM-PT-B	Device Management-Private Transfer-B		•
DM-TM-A	Device Management-Text Message-A	•	
DM-TM-B	Device Management-Text Message-B		•
DM-TS-B	Device Management-TimeSynchronization-B		•
DM-RD-B	Device Management-ReinitializeDevice-B		•
DM-BR-B	Device Management-Backup and Restore-B		•
DM-LM-B	Device Management-List Manipulation-B		•
DM-OCD-B	Device Management-Object Creation and Deletion-B		•

Standard Object Types Supported

Object Type	Creatable	Deletable
Analog Input		
Analog Output		
Analog Value		
Binary Input		
Binary Output		
Binary Value		
Calendar	•	•
Command	•	•
Device		
File		
Multi-state Output		
Multi-state Value		
Notification Class	•	•
Schedule	•	•
Trend Log		

Data Link Layer Options

•	BACnet IP, (Annex J)
•	BACnet IP, (Annex J), Foreign Device
	ISO 8802-3, Ethernet (Clause 7)
	ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
	ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
•	MS/TP master (Clause 9), baud rate(s): 9600 bps, 19200 bps, 38400 bps
	MS/TP slave (Clause 9), baud rate(s): _____
	Point-To-Point, EIA 232 (Clause 10), baud rate(s): _____
	Point-To-Point, modem, (Clause 10), baud rate(s): _____
	LonTalk, (Clause 11), medium: _____
	Other: _____

Segmentation Capability

Able to transmit segmented messages	Yes	Window Size: 32
Able to receive segmented messages	Yes	Window Size: 32

Device Address Binding

Is Static Device Binding supported?	Yes

Networking Options

•	Router, Clause 6 BACnet/IP (Annex J) to BACnet MS/TP
	Annex H.3, BACnet Tunneling Router over UDP/IP
•	BACnet/IP Broadcast Management Device (BBMD)
Yes	Does the BBMD support registrations by Foreign Devices?

Character Sets

•	ANSI X3.4
	ISO 10646 (UCS-2)
	IBM™/Microsoft™ DBCS
	ISO 10646 (ICS-4)
	ISO 8859-1
	JIS C 6226

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